THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

0-6697-CTR-P2

COMPANION POWERPOINT PRESENTATION TO UNITY DATABASE

TxDOT Project 0-6697-CTR: Integration of Data Sources to Optimize Freight Transportation in Texas

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Performing Organization:	**Sponsoring Organization:**
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Performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.

INTEGRATION OF DATA SOURCES TO OPTIMIZE FREIGHT TRANSPORTATION IN TEXAS

TXDOT Research Project 0-6697

December 2013

DRAFT
COMPANION PRESENTATION

Study Team

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Background

"The understanding of freight demand and the evaluation of current and future freight transportation capacity are not only determined by robust models, but are critically contingent on the availability of accurate data."

– Jolanda Prozzi

Background

Disaggregated freight flows are necessary to:

- provide a clear picture of freight movements
- determine the impact of freight on infrastructure and funding implications
- evaluate strategies for improving freight mobility
- forecast system performance
- mitigate impacts of truck traffic on general mobility
- improve transportation system performance and safety

Background

Numerous freight data sources exist but are found to be incompatible due to:

- different protocols in assigning origins and destinations
- different commodity classifications
- different assumptions to estimating or dealing with missing data
- different expansion factors and control totals
- different procedures used for data aggregation

Study Objectives

1. Develop a strategy for collecting and integrating available freight data

2. Explore the feasibility of entering into a data sharing partnership with the freight community

3. Develop a prototype Freight Data Architecture

4. Advise TXDOT on the cost-effectiveness of acquiring and maintaining a freight data sharing partnership

Related TXDOT and Federal Studies

- 0-4713: Development of Sources and Methods for Securing Truck Travel Data in Texas (2004)
- 0-6297: Freight Planning for Texas—Expanding the Dialogue (2011)
- NCFRP 9 – Guidance for Developing a Freight Transportation Data Architecture (2011)
- NCFRP 25: Freight Data Sharing Guidebook (2013)
- NCFRP 26: Guidebook for Developing Subnational Commodity Flow Data (2013)
- NCFRP 47 - Freight Transportation Data Architecture: Data Element Dictionary (ongoing)

Study Objectives

1. Develop a strategy for collecting and integrating available freight data
   I. Identify Texas Freight Data Needs
   II. Examine Existing Databases
   III. Examine Freight Data Collection Methods
   IV. Identify Current Data Gaps

Identify Texas Freight Data Needs

1. Conducted five workshops statewide
2. Participants include TXDOT, MPO and city planners
3. Discussions include:
   - What freight data do you use?
   - For what purpose(s) do you use the freight data?
   - Issues experience in obtaining reliable data?
   - What freight data variables do you need?
   - What level of detail do you require?
   - How would you use the proposed integrated Statewide Freight Database (what queries will you run)?

Identify Texas Freight Data Needs

4. Main sources of freight data include:
   - TXDOT truck volume counts including PMIS
   - Confidential Carload Waybill Sample
   - Freight Analysis Framework
   - Marine port data
   - TRANSEARCH
   - CRIS accident database

Identify Texas Freight Data Needs

5. General concerns include:
   - Assumptions used to disaggregate the data
   - Lack of disaggregated origin-destination data and routes (city, zip code, street level)
   - Lack of transportation planning involvement in industry decision-making
   - High costs of acquiring data (TRANSEARCH)

Identify Texas Freight Data Needs

5. General concerns (continued):
   - Outdated data
   - Reliability of “free public data”
   - Lack of traffic counts on local infrastructure
   - Lack of commodity information
   - Lack of information about seasonal movements

Existing Databases

- Mode of transport information is the most readily available in most of the databases.

- For roadway movements,
  - origin/destination points are insufficient to meet the needs of TXDOT
  - None of the databases contain information at a city or zip code level
  - Only one database (TRANSEARCH) contains information at a county level

Existing Databases

- For roadway movements (continued)
  - Lack of data for
    - traffic generators,
    - vehicle routing information,
    - trip frequencies, and
    - commodity flows at the city or zip code level.
- For rail, air, and vessel movements,
  - routing data is being collected but may be confidential (e.g. Carload Waybill Sample)

Existing Databases

- Advanced data integration methods may assist in filling some data gaps.

- Need for industry participation to provide data relating to
  - air quality (e.g. vehicle fleet age, engine type, vehicle type, roadway speeds),
  - service types (e.g. truckload, less-than-truckload, and just-in-time delivery),
  - trip purpose
  - actual production and attraction rates
  - model validation

Examine Freight Data Collection Methods

- Survey Data Collection Methods
  - Telephone interviews, mailout/mailback surveys, combination, trip diaries, roadside/intercept interviews, personal interviews
- Technological
  - Loop detectors, sensors, video imaging, GPS, toll tags, etc.

Identify Current Data Gaps

Database	Origin-Destination							
	Country		State	NTAR/ BEA/ CSA	County	City	Zip Code	Port Name
	Import	Export						
Commodity Flow Survey (CFS)		O	O	O				
Freight Analysis Framework (FAF)	O	O	O	O				Δ
Transearch / Reebie (Private)			O	O	O			
Carload Waybill Sample (Public Use Waybill Sample)	O	O	O	O				
Waterborne Commerce Statistics	O	O	O					O
Air Carrier Statistics (Form 41 Traffic)	O	O	O					O
Border Crossing/Entry Data	O		O					O
North America Transborder Freight Data	O	O	O					O
Maritime Administration (MARAD) database	O	O	O					O
USA Trade	O	O	O					O
Fresh, Fruit and Vegetables	O		O					
National Transportation Statistics (NTS)	O	O						
Annual Coal Report	O	O	O					
PIERS (private)	O	O	O					O
Texas Permitting & Routing Optimization System (TxPROS)			O			O	O	

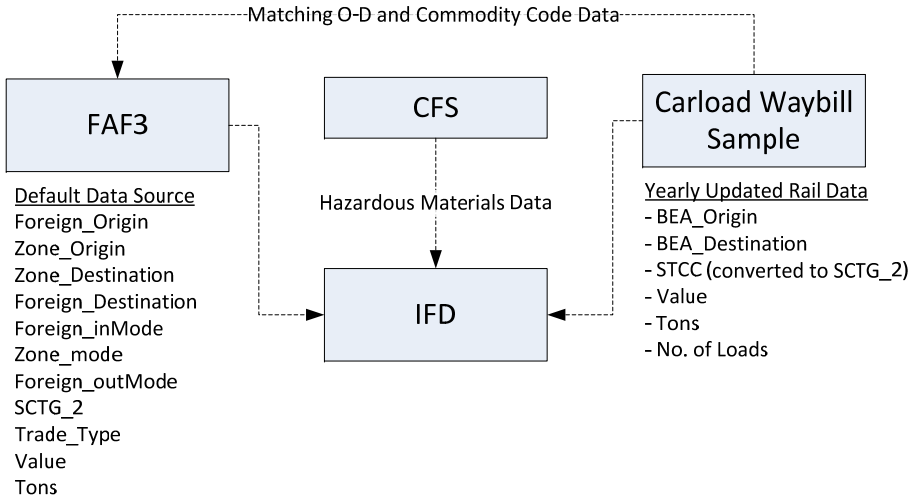
Identify Current Data Gaps

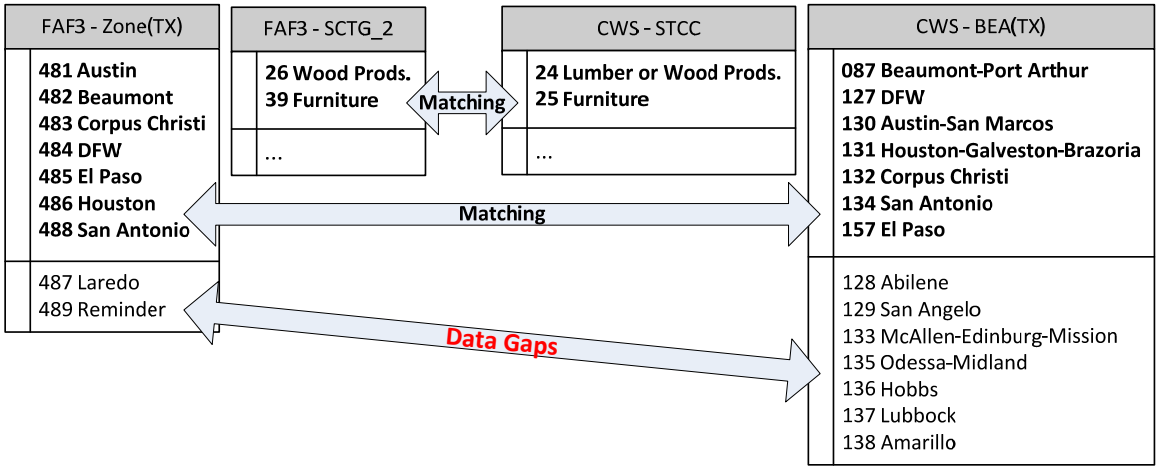
Database	Commodity Classification				Industry Classification
	SCTG	STCC	SITC	Harmonized Tariff Schedule	
Commodity Flow Survey (CFS)	2 Digit				NAICS
Freight Analysis Framework (FAF)	2 Digit				
Transearch / Reebie (Private)		4 Digit			
Carload Waybill Sample (Public Use Waybill Sample)		2 Digit			
Waterborne Commerce Statistics			4 Digit		
North America Transborder Freight Data				2 Digit	
Motor Carrier Management Information System (MCMIS) - Census File					O
USA Trade				HS	NAICS
National Transportation Statistics (NTS)	O				
Annual Coal Report					NAICS
PIERS (private)				HS	

Identify Current Data Gaps

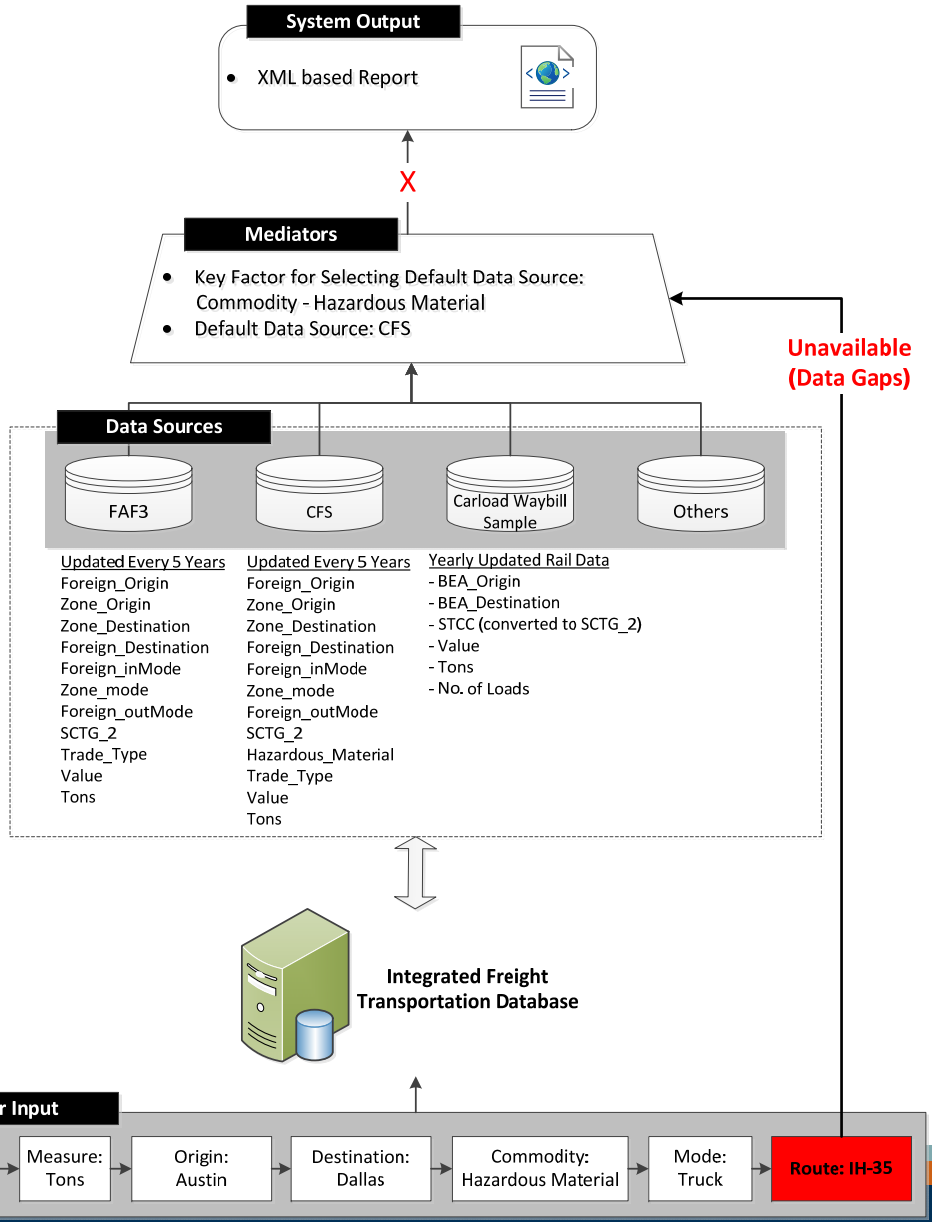
Database	Trip Frequency				
	Seasonal	Weekday	Time of Day	Traffic Count (AADT, AADRC, etc.)	Frequency of Data Collection
Commodity Flow Survey (CFS)					1997, 2002 & 2007
Freight Analysis Framework (FAF)					2007
Carload Waybill Sample (Public Use Waybill Sample)				Number of Carloads	Yearly
Waterborne Commerce Statistics					Yearly
Air Carrier Statistics (Form 41 Traffic)				O	Monthly
Border Crossing/Entry Data				O	Monthly, since 1995
North America Transborder Freight Data				O	Monthly, since 1994
Maritime Administration (MARAD) database				O	Annual
PMIS				O	Annual
Texas Crash Records Information System (CRIS)			O		Daily
PIERS (private)		O			Weekly
Texas Permitting & Routing Optimization System (TxPROS)		O			Daily

Identify Current Data Gaps





Identify Current Data Gaps



Freight Data Sharing Partnership

- Most stakeholders interviewed considered that a partnership would be beneficial

- Majority of stakeholders concerned with
  - the mishandling or improper use of data
  - time commitment required in scrubbing and preparing data in-house
  - new government regulations and law enforcement measures

Freight Data Sharing Partnership

- Lightening the information technology (IT) requirements for stakeholders is highly recommended.
- If guaranteed that the information would never become public, 88% of survey respondents were willing to participate in a data-sharing partnership.
- None of the respondents interviewed or surveyed are currently participating in a data-sharing partnership.

Freight Data Sharing Partnership

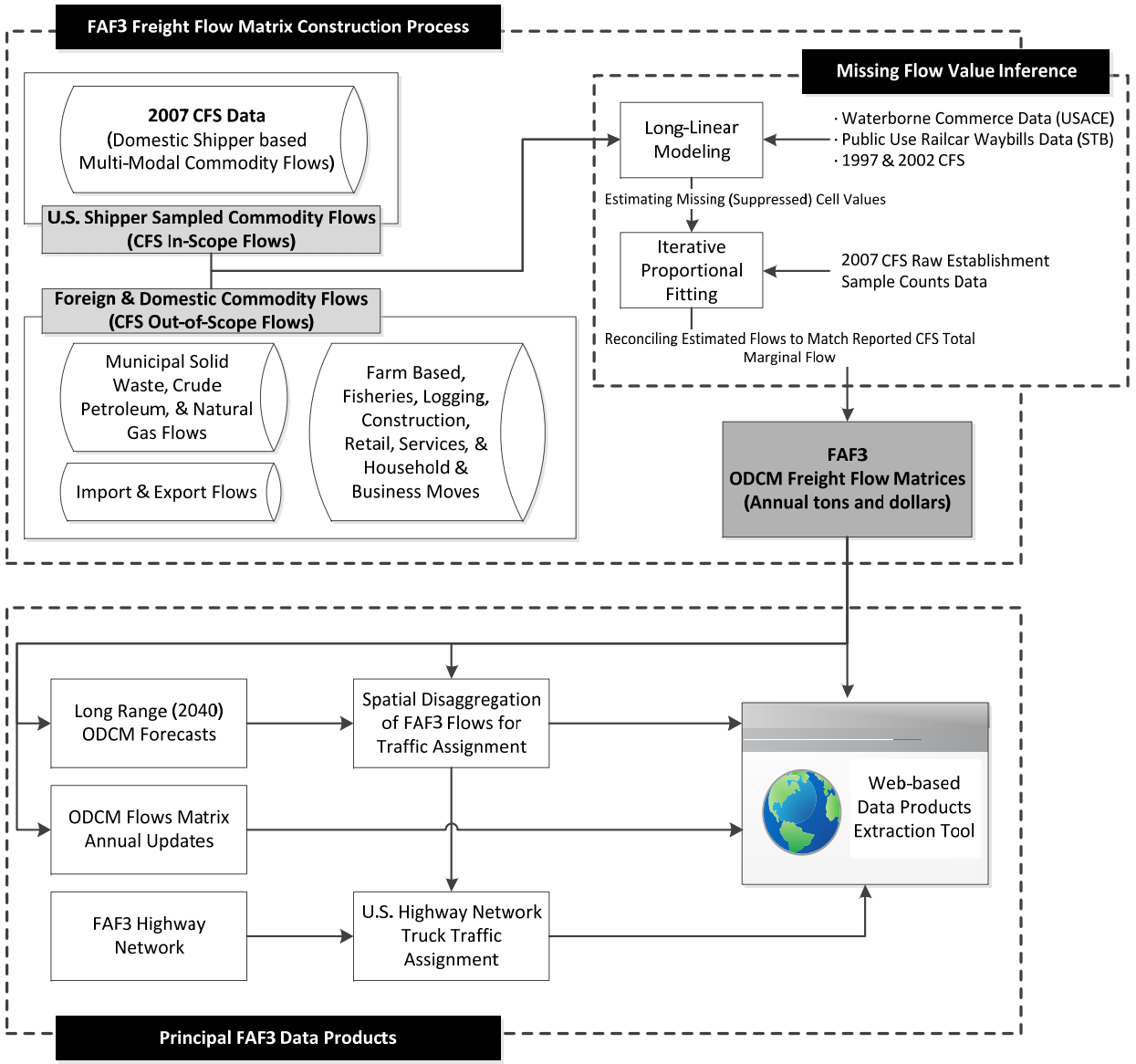
- Data variables that stakeholders were willing to share (by rank)
  - trip origin/destination
  - number of trips
  - vehicle type,
  - load type (truckload, less-than-truckload)
  - route preference,
  - commodity being transferred
  - cargo weight
  - mode of transport.
- A clear non-disclosure contract is required
- Support from trade associations such as TXTA was found to be invaluable in outreach efforts

Prototype Freight Data Architecture

- Examine existing architectures
- Develop conceptual architecture

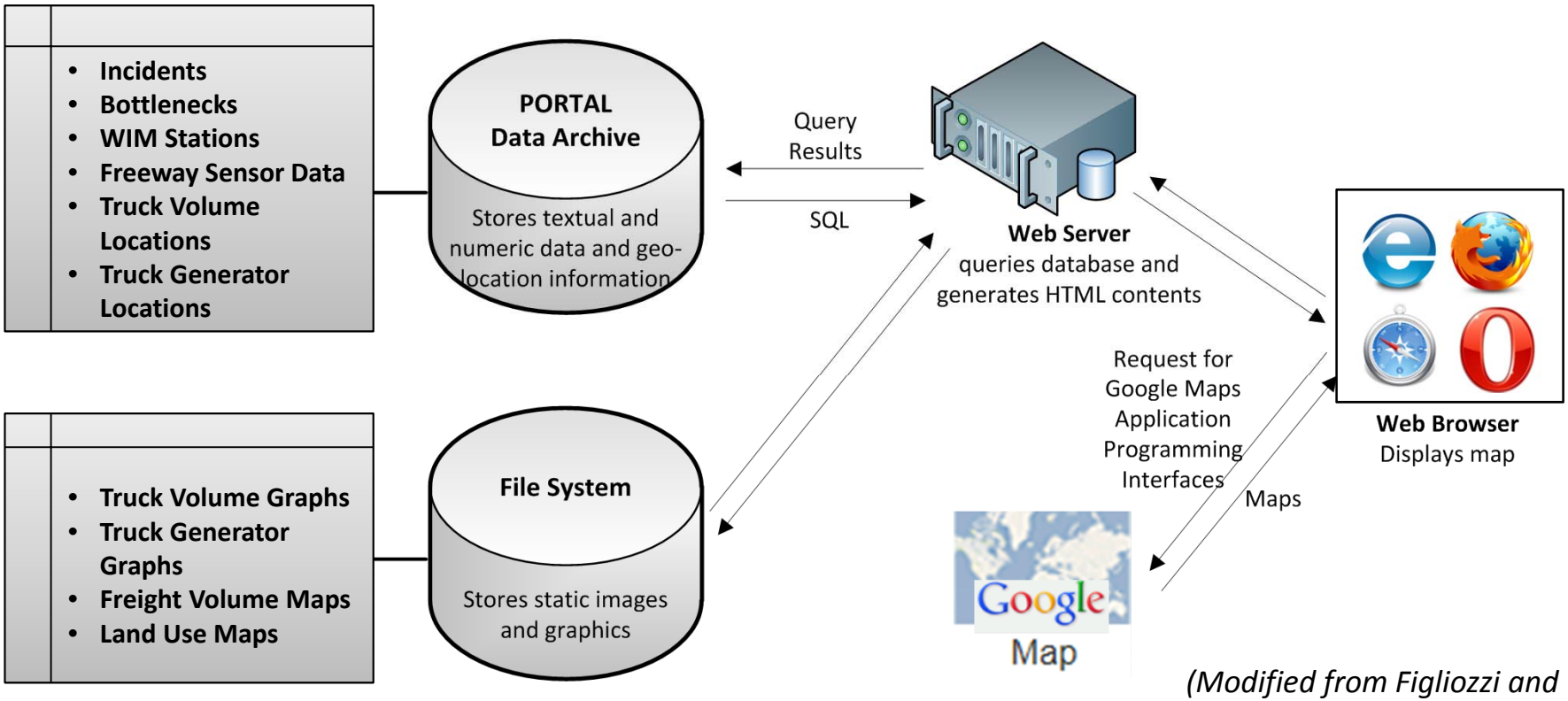
Existing Architectures

Freight Analysis Framework 3



Existing Architectures

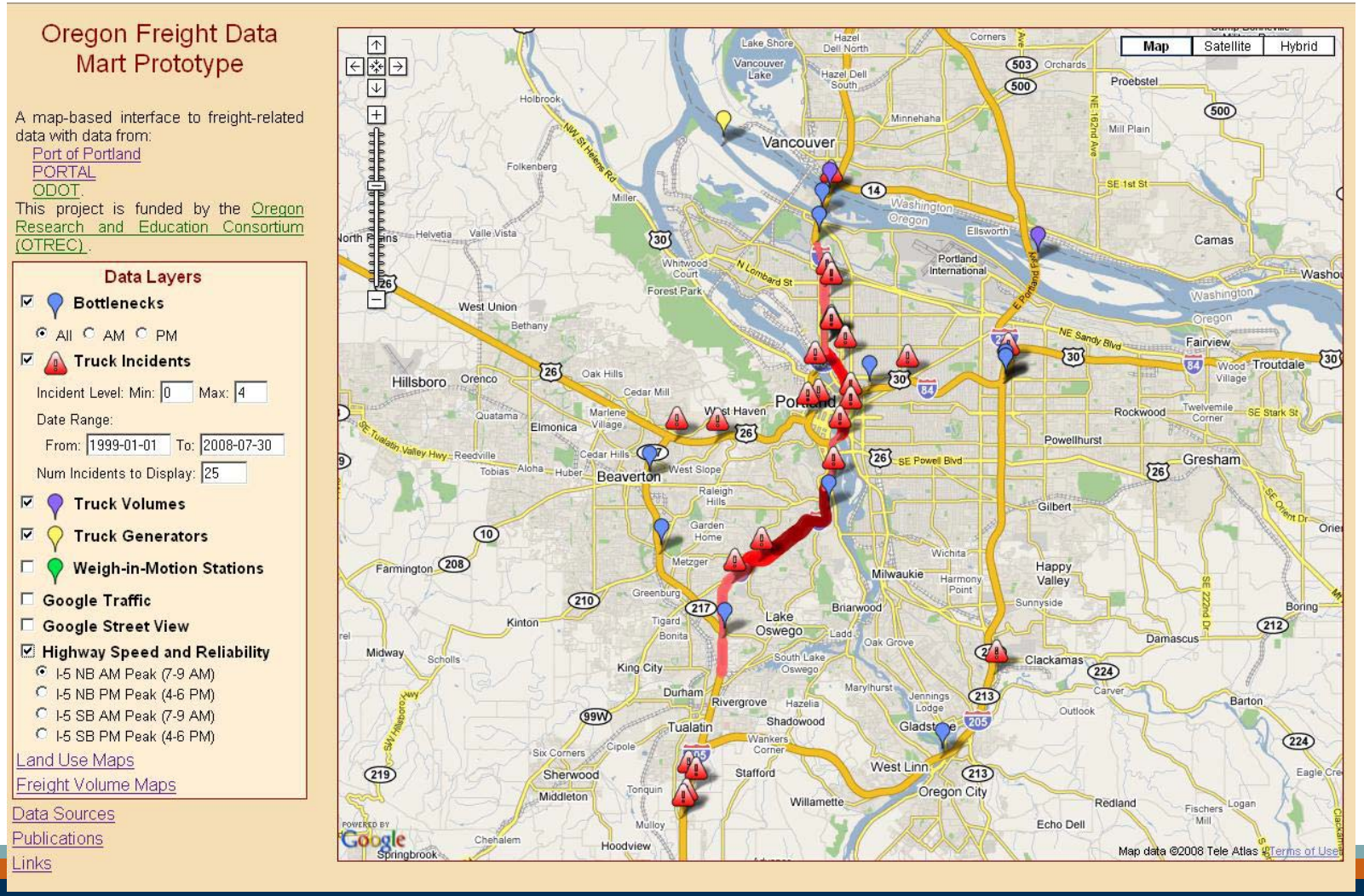
Oregon Freight Data-Mart System Architecture



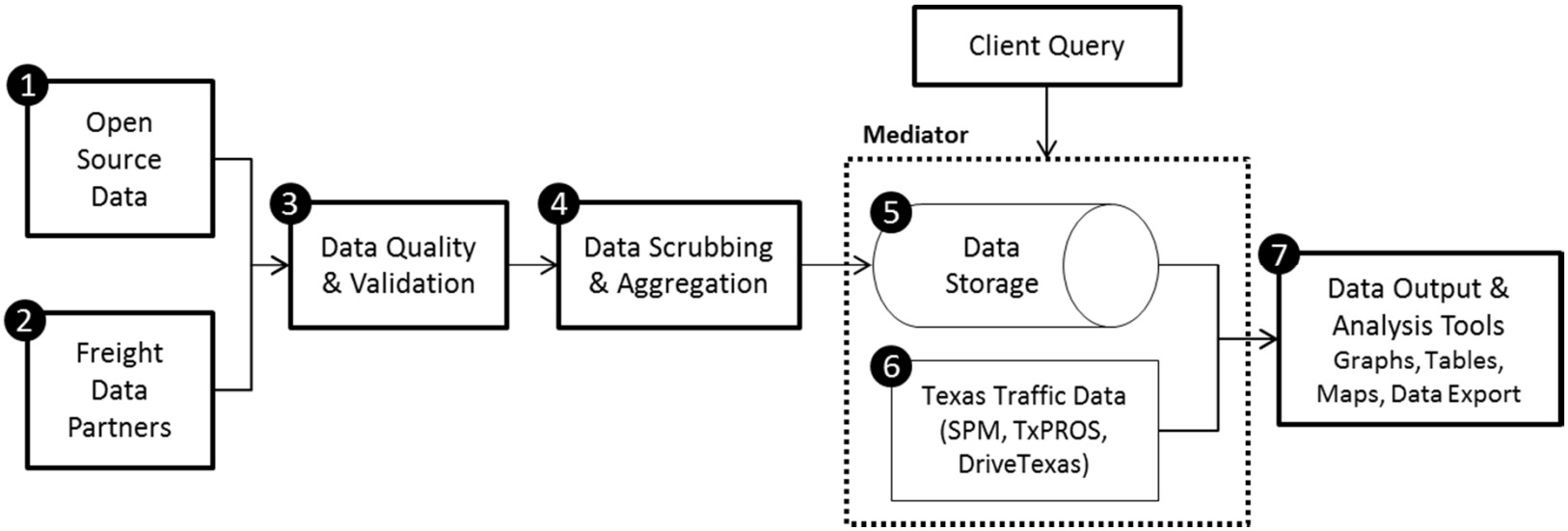
(Modified from Figliozzi and Tufte, 2010)

Existing Architectures

- Oregon Freight Data-Mart

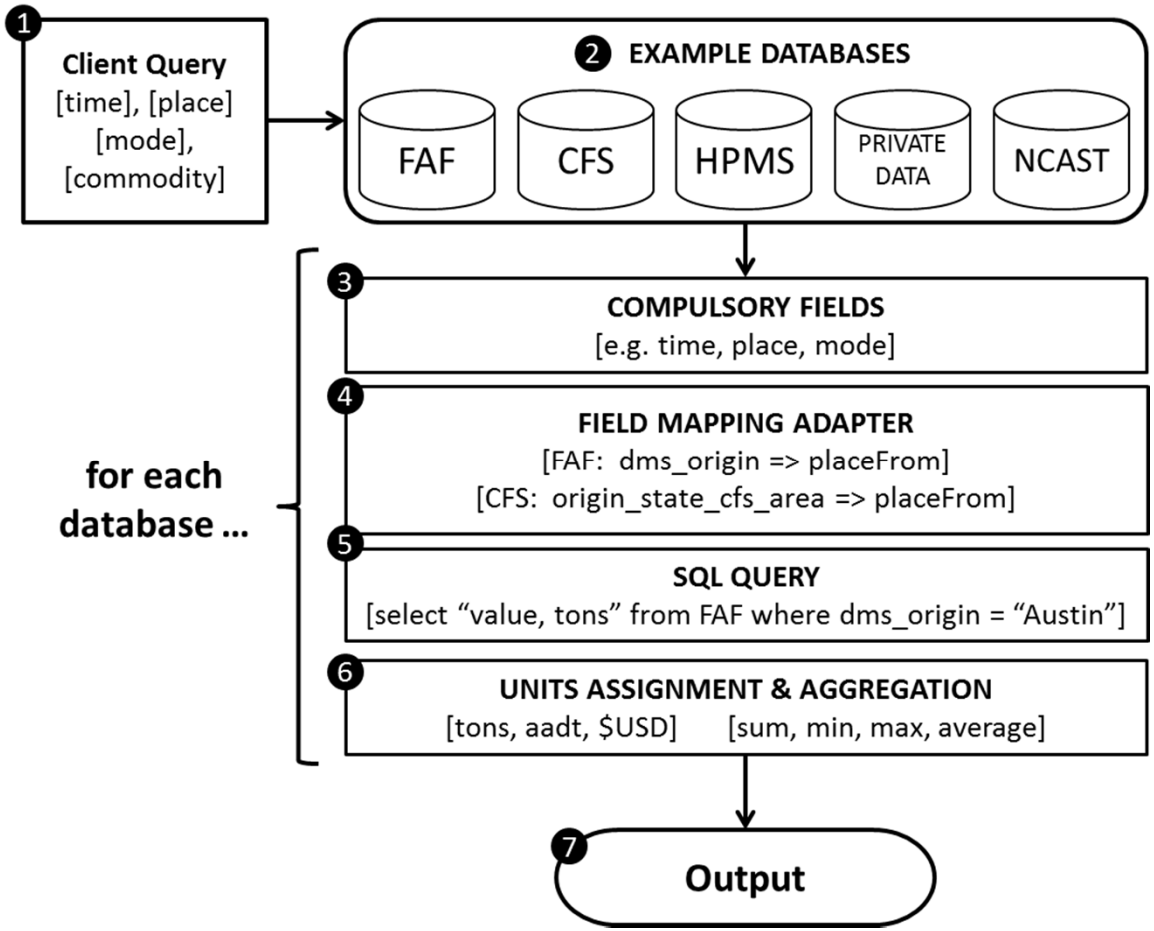


Proposed Texas Freight Data Conceptual Architecture



1. Integrate and use of publicly available data
2. Electronic submission of data by freight data sharing partners
3. Data quality and validation
4. Automated data scrubbing and aggregation
5. Secure data storage and restricted access
6. Value added services through integration into existing Texas traffic data centers
7. Data output and analysis tools

Mediator Architecture



Unity DB

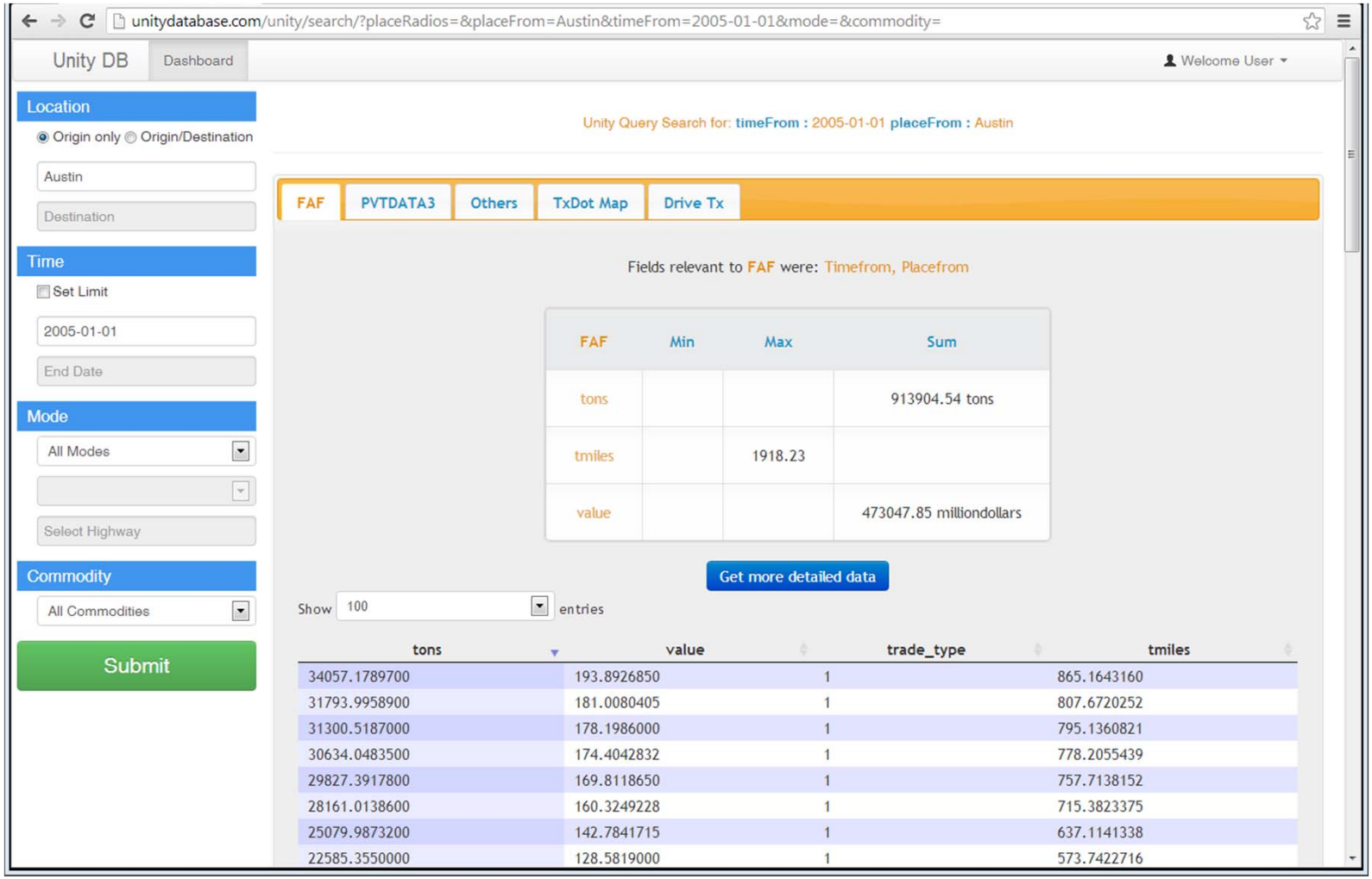
an integrated multimodal freight database

conceptual demo system is currently accessible at http://www.unitydatabase.com

Unity DB

- Currently includes the following databases:
  - Freight Analysis Framework
  - Commodity Flow Survey
  - TXDOT Highway Performance Monitoring System Traffic Data
  - ATRI National Corridors Analysis and Speed Tool (N-CAST)
  - Three private sector database samples

Unity DB Screenshot



Study Recommendations

1. Effective partnerships with private sector is needed to ensure adequate freight planning
2. Rigorous outreach and follow-up efforts will be required
3. Data sharing partnership will require a long-term commitment from TXDOT
4. Data from existing ITS technologies should be tapped

Study Recommendations

- Through advanced data integration methods, it is possible to overlay publicly available data sources to assist in filling some existing data gaps